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| RESEARCH ARTICLE

Medication Administration Practices Among Nurses: An Observational Study from Oman

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| ABSTRACT

Safe medication administration is vital in ensuring patients' safety and enhancing their quality of life. This study aimed to observe nurses' practice in medication administration in Hospitals and primary healthcare institutions to identify and examine the different steps of the medication administration process for quality assurance and safe drug administration. The methodology of the study employed a cross-sectional design using quantitative descriptive data within health institutions at South Sharqiyah Governorate. Data from the direct observation of 99 nurses (once at a time) were observed while they were preparing and administering medications using the disguised observation method (DDM). The data was recorded via Microsoft Access using a descriptive approach (frequencies and percentages) for analysis. The areas of concern in the study were: the five rights of medication administration, documentation, the use of patient's identifiers, double checking and drug labeling. The trained observer completed the checklist after observing the nurses' medication administration. Data were collected from 99 observations for analysis. Data analysis was conducted using descriptive and inferential statistics in the SPSS software version 26. The quantitative data illustrates that only 34.3% of nurses performed an independent double check by another nurse, only 56.6% performed appropriate labeling, and 62.6% confirmed the patient's identity using at least two patient identifiers. Most medication administrations meet the "Five Rights" criteria (right patient =92.9%; right medication=98%; right dose=97%; right route=98%; and right time=97%). A statistically significant association was found between the participant's age and right time (p=0.013); and between years of experience and right medication (p=0.005), right dose (p=0.019) and right route (p=0.004). In this study, the nurses' poor areas of practice in medication administration were identified as double-checking of medication, labeling, and use of patient identifiers. Checking the right of medication administration and documentation post the procedure was the most followed by nurses in the medication administration process. The relevance of the study to clinical practice is the continuing education and clinical audits for nurses regarding basic pharmacology, medication administration policy, factors contributing to medication errors, and strategies preventing medication errors should be a priority.

| KEYWORDS

Medication administration, medication errors, safety, nurses, observation

| ARTICLE INFORMATION

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1. Introduction

Providing safe medication administration is crucial in guaranteeing patients' safety and enhancing their quality of life (Jessurun et al., 2015). This multifaceted system is a multi-disciplinary concept involving some healthcare providers such as physicians, nursing

and pharmacy staff who safeguard the delivery of medication to patients innocently (Kuitunen et al., 2021). Medication errors frequently happen in clinical settings and may increase patient morbidity, mortality and healthcare costs (World Health Organization, 2017). Most often in this region, the evaluation of medication errors depends only on risk reports to initiate process improvement needs (Izadpanah, 2018). However, alternative methods such as trigger tools and direct observation can complement current knowledge without relying on the single scheme mentality. Since there are many steps in the medication administration process, error is inevitable if the standard guideline is not followed. An observational study found that 79% of medications were not labeled by nurses properly, 82% failure of the use of two patient identifiers in the administered medications, 91% of medication administrations did not adhere to the "Five Rights" criteria, 71% failure to maintain independent double-check, and 84% of the observed medication administrations involved inevitable interruptions (Surji, 2018).

Medication administration is a core function of the nurses, as nurses spend up to 40% of their routine bedside work on the medication administration process (Izadpanah, 2018). Nurses are academically prepared, ethically accountable and professionally responsible for maintaining their roles safely in clinical settings. Nurses are practicing safe medication administration using a framework known as the 'five-rights' of medication administration (Bayatmanesh et al.,2019). This framework is considered a standard guide for safe medication administration practice. The principle of the framework is to ensure that the right patient receives the right drug at the right time in the right dose and by the right route, evaluate the administered medication's desired effects, correct the undesirable consequences (Jessurun et al., 2015; Manias et al., 2020). Nurses also should maintain the proper documentation for the administered drug as well as provide proper education for the patients/families; however, some nurses ignore these crucial principles in medication administration process (Manias et al., 2020; Hutton et al., 2021) The framework of medication administration has been modified as to include other rights such as right documentation, right assessment, right to refuse, right evaluation (Izadpanah, 2018; Shafter et al., 2019; Hutton et al.,2021;). This framework is also used to assess the clinical competencies and audit medication administration practices for nurses' errors (Manias et al., Shafter et al., 2019). However, an observational study of nurses revealed that medication administration was practiced based on the medication administration framework, as most nurses do not adhere to following the five rights of medication administration (Teal,2019).

Numerous studies show that nurse-related medication errors often occur during the medication administration process (Jessurun et al., 2015; Shafter et al.,2019; Hutton et al., 2021;). Thus, it is crucial to observe the principles of the medication administration process before the drug is administered to the patient, determine appropriate care goals, administer safe and effective medications, and evaluate the effectiveness and outcomes of medications during and after medication administration (Schroers et al.,2020). Moreover, continuous monitoring of nurses' compliance with the principles of medication administration is essential to the nurses' leaders and nurses' clinical educators (Assunção-Costa et al.,2022). In addition, most studies focused on the factors such as nurses' shift work, heavy workload, shortage of nurses, and look-alike drugs that contribute directly to medication errors (Parry et al., 2015; AL Nasri and AL Blushi, 2022). Whereas limited studies focused on the direct observation of medication administration practices among nurses. In Oman, medication safety practice was considered as a core standard in patient safety initiatives and the policies of the medication administration process are disseminated to the health care professionals. Anecdotal evidence from direct monitoring of nurses showed that nurses do not adhere to some aspects of medication administration procedures such as double-checking, five rights, and medication labeling. Incident reports related to medication administration safety are also high. Providing structured and direct monitoring of the medication process among nurses will help to identify gaps in medication administration practice and initiate solutions accordingly. This study is also expected to empower nurses to deliver safe, skilled care and healthier treatment related to medication administration. The study is also essential in revising the current evidence-based practice and renewing the protocols related to drug administration practice. It will also provide a clear overview of the requirement for new strategies in training and education related to drug administration practice.

Therefore, the aim of this study is to observe medication delivery procedures among nurses working in Hospitals and primary healthcare institutions in the South Sharqiyah governorate. Furthermore, the survey team anticipates identifying and examining the different steps of the medication process for further improvement for a healthier and safer medication administration practice. This study also assessed nurses' medication administration practices and its relationship with some demographic characteristics.

2. Materials and methods:

2.1 Study design

This observational study adopts the direct observation of drug administration conducted at multicenter primary healthcare institutions, including health centers, polyclinics and primary healthcare in-patients' hospitals. The data was collected between November 2022 and February 2023.

2.2 Study Participants and Sampling

The participants were 99 nurses from multicenter health institutions. The Inclusion criteria were: nurses who work in clinical practice, and provide consent to participate in the study. Nurses on leave or working in the administration were excluded from the study. Sampling was done by convenience.

2.3 Data collection technique and Tool

The researcher (Principal Investigator) organized a team of well-instructed qualified nurses with 10 years and above experience as nurse leaders and clinical facilitators. The data collectors have been trained comprehensively in conducting the audit and using the tool. A direct observational study was conducted on all shift duty for morning shifts, evening and night. Each participant had a chance to be observed (one observation only). The observer spent between 25-30 minutes observing each nurse separately. The observation process includes the preparation and administration of the medication. Medication administration is described as preparing, administering and evaluating the effectiveness of drugs by qualified personnel to ensure proper patient and medication identification and documentation of medication administration in the medical record [2,4,5]. The data collection was held at a multicenter health institution, and each auditor (observer) was responsible for the specific health institutions of data collection. Although there was previous coordination with the nursing manager and head nurses of wards, the researcher obtained permission from the research units. To maintain the reliability of the data collection process and prevent already known biases, the observed nurses were not informed about the observations previously, only on the data collection time. The data was collected on medication administration using the disguised observation method, meaning that nursing staff needed to be made aware of the study's detailed purpose and the tool's content to prevent a Hawthorne effect (Dean & Barber,2001). The participants were explained that the analysis was performed to examine the medication process. The participants were assured of confidentiality and anonymity and that the observations would be unrelated to their evaluation. The observer maintained a distance from the nurse, which allowed the performance observation of the procedure without disturbing the observed professional nurse. The observer did not intervene or judge the nurse's work unless a potential error occurred. In this case, the observer notified the nurse and the case was recorded as an error.

The tool was adapted from the Ministry of Health policies and Lippincott and Williams for nursing procedures. The study was concealed to assure validity and reliability in obtaining the accurate results of the routine nursing practices without putting the participants under pressure as it may affect their normal behavior and skew the findings.

The observation tool consists of two sections: the demographic characteristics and clinical variables of the nurses, including age, gender, years of experience, working place, level of education, shift work and other variables. The second section was designed to precisely imitate the sequence of events during medication administration. The form consists of "Yes, No, N/A (Not Applicable). These items were evaluated in the nurse's medication administration in three stages before, during, and after. This questionnaire was filled out by the auditor/observer electronically after the observation. The observer will then interview the nurse for demographic and clinical variables.

2.4 Ethical considerations

The study was approved by the regional committee and by the Institutional Review Board of the Ministry of Health, Sultanate of Oman. All participant information was confidential, and consent was taken from them prior to the observation.

2.5 Data analysis

A descriptive approach (frequencies and percentages) was used in data analysis and inferential statistics in the statistical package for social sciences SPSS software (version 26). A p value < 0.05 was considered statistically significant; the more consequential the finding, the smaller the p-value obtained. The chi-square test and Pearson's correlation coefficient were used to assess the study hypotheses and the significance between quantitative variables.

3. Results

3.1 General characteristics and clinical variables:

The demographic characteristics of the observed 99 nurses are shown in Table 1. During the period from November 2022 to February 2023, 99 observations of medication administration practice were collected. Of these, more female nurses have been observed were than males (92.9%, n=92). More than half of the participants (65.7%, n=65) were 31-40 years old. The majority of the participants have diploma certificates (74.7%; n=74). More than half of the observed nurses revealed that they had taken training in drug administration practice (68.7%, n=68). Similarly, nurses reported that they have updated policy/guidelines of Drug administration practice and calculations in their departments (68.7%, n=68). Further details regarding the demography of the participants & other clinical variables are mentioned in Table 1.

Figure 1 shows the number of administered medications in terms of route. The most administered medications were intravenously (59.6%, n=59), and only (1%, n=1) were issued intradermally.

3.2 Medication administration process:

Most of the nurses verified the medication orders in electronic medical records (91.9%; *n*=91), and most participants avoided distraction and interruption when preparing the medication (85.9%, *n*=85). Around (79.8%, *n*=79) nurses checked the patient's relevant medical history and for any allergies or contraindications to the prescribed medication, compared to (20.2%, *n*=20) nurses who did not check. This study found that out of 99 observations, nurses labelled appropriately (56.6%, *n*=56) while (16.2%, *n*=16) of medication were not labeled. In another (27.3%, *n*=27) of the observations, labeling the medication was not necessary (N/A) for observed medications because they were administered immediately to the patients.

3.3 The medication administration rights:

The Five Rights of Medication Administration include the right patient, right medication, right dose, right route, and the right time which are important steps that need to be completed by the practitioner before administering any medication to the patient. Based on the direct observation reporting, the majority of nurses in the observations maintained the principles of ''rights of medication administration''. For instance, out of 99 observations, right patient (92.9%, *n*=92), Right medication (98.0%, *n*=97), Right dose (97.0%, *n*=96), right route (98.0%, *n*=97), right time (97.0%, *n*=96). This study found that Right patient education, Right patient to refuse, Right assessment and right evaluation were the less frequent applied by the nurses during the observations (75.8%, *n*=75; 77.8%; *n*=77; 72.7%, *n*=72; and 73.7%, *n*=73) respectively.

This study noted that a higher number of nurses did not perform an independent double-check by another registered nurse before administering the medications (34.3%, *n*=34). Similarly, fewer nurses during the observation confirmed the patient's identity using at least two patient identifiers (62.6%, *n*=62). Regarding hand hygiene, (88.9%, *n*=88) nurses performed hand hygiene before the preparation compared to (74.7%, *n*=74) who performed hand hygiene after the administration procedure. The study has also revealed that most of the observed nurses adhered to maintaining documentation post-procedure (90.9%, *n*=9), in comparison to the nurses who did not maintain documentation (9.1%, *n*=9). Whereas few nurses introduced themself to the patient (35.4%, *n*=35).

3.4 Correlation of demographic characteristics and medications administrations components:

Table 3. represents the correlation between the demographic data and the main components of the medication administration process. Regarding age, the study revealed a correlation between age and the '' right time" of medication right (*p*=1.013). It is also noted that there is a correlation between age and documentation post-procedure (*p*=0.001). Furthermore, the *p* value was found to be (0.005) in terms of years of experience and the right medication. A significant correlation was also noted between years of experience and the right medication, the right dose, the right route and the right time (*p* values=0.005; 0.019; 0.004; 0.010), respectively. In regards to duty shift, a significant correlation between duty shift and right patient (*p*=0.011); and duty shift and right medication (*p*=0.013).

4. Discussion

Safe medication administration is considered as top priority in ensuring patients' safety and enhancing their quality of life (Schroers et al.,2020; Nafaji et al., 2022). To the author's knowledge, this is the first study in Oman to assess the medication administration delivery process among nurses. This study aimed to observe the medication administration process by direct observation of nurses in multicenter Hospitals and primary healthcare settings. It also identified the relationship between demographic data and some dimensions of the medication administration process. The key identifiable dimensions were: rights of medication administration, Double checks, Use of patient Identifiers, Medication Labeling and documentation.

4.1 Rights of medication administration:

Nurses must be aware that maintaining the five rights of medication administration is very important. In most cases, the mortality rate is high from missing just one step in the five rights of medication administration (Shafter et al.,2019; Kuitunen et al., 2021). Similar to the study of (Aboulmaati et al., 2023), this study found that most of the observed nurses maintained the ''five rights of medication administration '', right patient, right medication, right dose, right route and right time. This is contradicted by another study that observed 72 nurses on medication administration and revealed that 90% of medication administrations did not meet the "Five Rights" criteria (Surji,2018). Another study concluded that practicing the five-rights medication administration by nurses was not as routine as the rights framework suggests (Martyn,2019).

The right patient was the least checked among the five right criteria, similar to the studies of (Surji,2018; Manias et al.,2020). Similar findings of this study in regards to medication rights, such right patient to refuse, right documentation & right patient education, were found almost similar to the study of (Abouelmaati et al., 2023). An analysis investigated the 1,273-medication error incident database from medical records and revealed that the most common reason for medication was the wrong time (Kim et al.,2018). An increasing number of recent studies have identified inadequacies of the 'five rights of medication administration' in the daily practice of nurses due to factors that induce workplace strains such as workload, being under-staffed, more patients/increased patient flow and interruptions by other people or tasks (Wondmieneh et al.,2020; Pourhosseiny et al.,2022) Other reasons might

be inadequate educational activities related to medication administration, as well as inadequate quality performance audits checking nurses' compliance regarding medication administration.

4.2 Double checking

Double checking of medication administration (read-read back) is a procedure that involves two practitioners independently verifying the exact information about the medication that requires verification when prescribing, preparing, dispensing, or administering a medication before administrating it to the patient (Schwappach,2016). Double-checking is considered a standard safety practice, as the potential safety benefits of double-checking by two individuals reduce medication errors by minimizing endogenous errors that arise from one individual verification. Studies have shown that double checking in medication administration can reduce up to 95% of incidents related to medication errors (Koyama et al.,2019). However, while previous research focused only on adherence and the absence of the double-check in medication administration, the present study revealed that very few observed nurses performed an independent double-check by another registered nurse, similar to studies of (Surji,2018; Westbrook et al.,2020). In contrast, other studies found that more than half of the nurses implemented Independent double checking before medication administration (Schwappach, 2016; Kadang et al.,2020). Thus, this study revealed that the absence of double-checking in medication administration procedures is considered a factor in medication errors among nurses.

The barriers to performing double-checking by nurses with the double check in medication administration can be partly explained by the shortage of nurses, the physical design of the unit and a lack of written medication orders (Sletten et al.,2022). In most primary health care settings, nurses are delegated to the clinics/nursing services alone, so they need help to call other nurses to verify each administered medication. Due to the additional time burden added to the existing nursing workload, these double checks should be strategically targeted to the highest-risk medications and processes, such as high-alert medications and controlled drugs and other medications that are continuously infused.

4.3 Confirm the patient's identity using at least two patient identifiers.

As clearly mentioned by the standards and policies for the medication administration process, the patient's identity must be confirmed before any serious omission occurs by using two different identifiers. Before critical tasks, including medication administration, two patient identifiers must confirm to verify a patient's identity (Martyn, 2019). Examples of methods of identifying patients before administering medication to the patient include asking for the patient's full name, date of birth and other details to compare them to the electronic medical record. However, this method is difficult to be maintained in case the patient is unconscious or a child. In these instances, nurses use wristbands that are kept on the patient at all times and patient details are written and then confirmed with medical records.

This study found that only 62.6% have confirmed the patient's identity using at least two patient identifiers. This is Unlike the recent research that have observed around 120 nurses caring for elderly patients and assessed medication administration principles and errors (Abouelmaati et al.,2023). The study found that 80% of nurses have used at least two ways to check a patient's identity before medication administration. In contrast, one study revealed that 83% of observed medication administration by the nursing staff was not identified as per standards (Surji,2018). The main reasons for identification failure among nurses in medication administration are lack of wristband attached to the patient hand (Surji,2018; Martyn, 2019), stressful environment and workload (Shahbaz et al.,2020). Literature suggests some strategies to improve compliance with checking patient identification and improve the efficiency and safety of the medication administration process, such as electronic medical records and the barcode system (Koyama,2019). Other strategies incorporate training on procedures for checking/verifying a patient's identity during the orientation, continuing professional development for healthcare workers and involving the patient in the identification process (Ragheb et al.,2016).

4.4 Medication labeling

One of the crucial components in the medication administration process is labeling the medication, which is required if the medication is not administered immediately (Nafaji et al.,2022). The medication label must have details such as the "name of the medication, the dose or amount, and the expiration date (Ragheb et al.,2016). It is also important to label the intravenous fluid if the medication is added to it or if the medicine has to be given for a long time through a syringe pump or other devices. The nurse should maintain medication labeling to prevent medication errors and avoid mixing the drugs in one patient or between different patients. Medication labeling is maintained for all medication routes, especially for medications that are given for a long time through intravenous infusion. A medication container or syringe should always be labelled to prevent administering the wrong medication to the wrong patient. In this study, more than half of the nurses-maintained medication labeling for the required medication, which is not similar findings of the survey (Surji,2018), as labeling of medication by nurses was poor as only 15 % of the medication had been labeled by the nurses. Other studies found that most nurses have provided labeling for the medication before administration (Young et al., 2015; Abouelmaati et al.,2023). However, studies have agreed that most recommended information on medication labeling was not maintained/mentioned, such as patients and medication details. Thus, a barcoded medication administration system would help ensure the five rights of medication administration.

4.5 Documentation post procedure

This study revealed that most nurses had documented the medication post-medication administration in the patient's medication-administered record (MAR) in the Al-Shifa system. However, other studies found less compliance in documentation following medication by nurses (Manias et al.,2020; Abouelmaati et al.,2023).

Literature suggests that technologies help practitioners administer medication effectively and safely. For example, Barcode medication administration (BCMA) technology reduces medication administration errors by labelling patients' details. It links the medical records with the correct dose of the proper medication to the right patient at the right time. A 40 % reduction in medication errors and a 50% decrease in potential adverse drug events were observed after the implementation of comprehensive barcoding/electronic medical administration technology (Naidu et al.,2019). Other recent strategies to reduce medication errors and help nurses deliver medication safely are using intelligent infusion pumps with dose Error Reduction Software (DERS) and a drug library. Staff development and continuous education in medication administration is a highly recommended strategy that reminds nurses of the medication administration process and refreshes their knowledge and skills. It is also suggested to conduct frequent quality management audits by nurse leaders in the medication administration process.

5. Conclusion

This study was conducted to observe nurses' practice of medication administration in Hospitals and primary healthcare institutions to identify and examine the different steps of the medication administration process for quality assurance and safe drug administration. The research study was performed by the direct observational method on the medication administration process among nurses in primary health care settings, which is rarely conducted as a tool of evaluation. The direct observation by the research focused on specific areas of the medication administration process, such as identifying the poor areas of practice based on the standard guideline for medication administration, such as labeling, the rights of medication administration, use of patient identifiers, drug labeling documentation, and double-check. This study revealed that double-checking and use of patients' identifiers were the least performed by nurses in the medication administration process. Whereas the medication rights were mostly performed by the nurses during the observation. This study has added new knowledge in this field as there is lack of similar studies in Oman considering medication administration process. Thus, identifying gaps in preparing and administering medication by nurses will definitely provide strategies for improvements, which will decrease incidents related to medication administration and improve the quality of care.

This study has some limitations. The first limitation of the present study was that the Hawthorne effect could occur during data collection due to the nature of the study method, which was direct observation. This was managed through the training of data collectors and also their experience of working as trainers and auditors at clinical bedsides. Additionally, it highlights the inadequacy in medication administration among nurse staff in healthcare centers of a single state of the country (South Sharqiyah) that require to broaden to include a broader scope among other healthcare centers of different sizes and departments and in different states. Notwithstanding this, the present study serves as a prelude for future research pertaining to understanding the current gaps concerning drug administration practices in accordance with medical guidelines.

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Appendix

Table 1: Description of sociodemographic characteristics of the participant's n=99

	Study sample (*n*=99)	
Variables	**No.**	**Percentage %**
Gender		
Male	**7**	**(7.1%)**
Female	**92**	**(92.9%)**
Age		
Less than 25	**2**	**(2.0%)**
25-30	**8**	**(23.2%)**
31-35	**35**	**(35.4%)**
36-40	**31**	**(31.3%)**
More than 45	**2**	**(2.0%)**
Nationality		
Omani	**58**	**(58.6%)**
Non-Omani	**41**	**(41.4%)**
Education		
Diploma	**74**	**(74.7%)**
BSC	**24**	**(24.2%)**
Master	**1**	**(1.0%)**
Working institute		
Primary health center	**39**	**(39.4%)**
Hospital	**60**	**(60.6%)**
Years of experience		
Less than one	**2**	**(2.0%)**
1-5 years	**20**	**(20.2%)**
6-10 years	**32**	**(32.3%)**
11-15 years	**26**	**(26.3%)**
16-20 years	**16**	**(16.2%)**
More than 25 years	**3**	**(3.0%)**
Duty shifts		
Morning	**88**	**(88.9%)**
Afternoon	**5**	**(5.1%)**
Night	**6**	**(6.1%)**
Have you taken any types of training in medication administration?		
Yes	**68**	**(68.7%)**
No	**31**	**(31.3%)**
Do you have updated policy/guidelines of Drug administration practice and calculations in your department		
Yes	**68**	**(68.7%)**
No	**31**	**(31.3%)**

Table 2: Observed nurses' performance of medication administration principles (n=99)

	The element	YES	NO	NOT/APPLICABLE
	Preparation			
1.	verify the medication order (computerized	91 (91.9%)	8 (8.1%)	
2.	verify the medication order in the register	41 (41.4%)	14 (14.1%)	44 (44.0%)
3.	Avoid distraction and interruption when preparing the medication.]	85 (85.9%)	14 (14.1%)	
4	Prepare the medication for only one patient at a time	97 (98.0%)	2 (2.0%)	
5.	Check the patient's relevant medical history and for any allergies or contraindications to the prescribed medication.]	79 (79.8%)	20 (20.2%)	
6.	Perform appropriate labeling	56 (56.6%)	16 (16.2%)	27 (27.3%)
7.	verify the medication order (computerized	91 (91.9%)	8 (8.1%)	
8.	Perform an independent double-check by another registered nurse	34 (34.3%)	65 (65.7%)	
9.	Right patient	92 (92.9%)	7 (7.1%)	
10.	Right medication	97 (98.0%)	2 (2.0%)	
11.	Right dose	96 (97.0%)	3 (3.0%)	
12.	Right route	97 (98.0%)	2 (2.0%)	
13.	Right time	96 (97.0%)	3 (3.0%)	
14.	Right patient education	75 (75.8%)	24 (24.2%)	
15.	Right Documentation	90 (90.9%)	9 (9.1%)	
16.	Right patient to refuse	77 (77.8%)	20 (20.2%)	2 (2.0%)
17.	Right assessment	72 (72.7%)	27 (27.3%)	
18.	Right evaluation	73 (73.7%)	24 (24.4%)	2 (2.0%)
19.	Confirm the patient's identity using at least two patient identifiers.	62 (62.6%)	37 (37.4%)	
	Administration			
2021	Perform hand hygiene before the preparation Perform hand preparation	88 (88.9%)	11 (11.1%)	
21.	Ensure adequate privacy and place the patient in a comfortable position.	94 (94.9%)	5 (5.1%)	
22.	The nurse introduces her/his self to the patient	35 (35.4%)	64 (64.6%)	
23.	Explain the procedure to the patient	84 (84.8%)	15 (15.2%)	
	Post administration			
24.	Dispose of the equipment according to the MOH Policy]	96 (97.0%)	3 (3.0%)	
25.	Perform hand hygiene after the administration procedure	74 (74.7%)	25 (25.3%)	
26.	Document and sign in the patient's medication administered record (MAR) in Al-Shifa system	90 (90.9%)	9 (9.1%)	
27.	Document and sign in the patient's medication administered record (MAR) in the register	41 (41.4%)	13 (13.1%)	45 (45.5%)

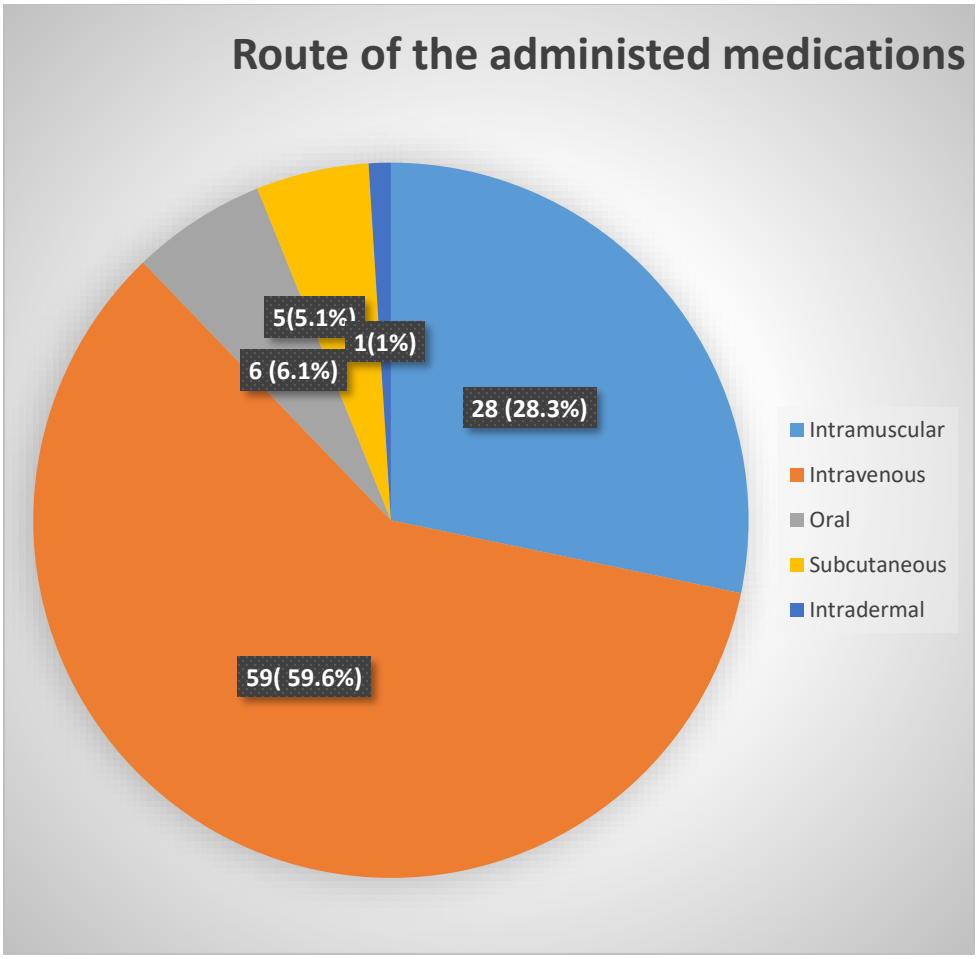

Figure 1: Percentage and numbers of the administered medications in the observed medications in terms of route (n=99)

Table 3: Correlation between variables *(P* value)

	Demographic Variables	'' The five medication rights"					Double checking	Patients Identifiers	Mediation labeling	Documentation Post procedure
		Right Patient	Right Medication	Right dose	Right Route	Right Time				
1.	Age	0.418	0.712	0.857	0.057	0.013	0.774	0.475	0.673	0.001
2.	Education	0.280	0.708	0.593	0.688	0.921	0.758	0.168	0.841	0.770
3.	Working institution	0.072	0.076	0.029	0.756	0.326	0.793	0.857	0.909	0.696
4.	Years of experience	0.437	0.005	0.019	0.004	0.010	0.408	0.074	0.037	0.257
5.	Duty shift	0.011	0.013	0.072	0.880	0.824	0.067	0.129	0.497	0.539